ORGANIC GARDENING

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J. I. Rodale, Editor Sir Albert Howard, C.I.E., M.A., Associate Editor

With The Editor

Chemical Fertilizers Are Too Strong

THAT chemical fertilizers are poisonous is a well-known fact. One of the most frequent offenders is sulphur. R. L. Emerson, M.D. in "Legal Medicine and Toxicology", D. Appleton & Co., says, in reference to sulphuric acid, "It has been used often by the poorer classes as a suicidal agent, where difficulty was experienced in obtaining other poisons."

Sulphuric acid is a very important element in the manufacture of one of our most popular chemical fertilizers—superphosphate. According to Prof. Gilbeart H. Collings in "Commercial Fertilizers" (Blakiston Co., Phila.), in 1939 out of a total of 1,994,023 tons of fertilizers used in the United States, 702,135 tons were superphosphate. It is made by taking raw ground phosphate rock and putting it into a chemical action with sulphuric acid. We highly recommend the use of ground phosphate rock by itself. It may be slow acting but it usually contains no corrosive substances. By introducing sulphuric acid into the chemical picture it becomes more soluble or quick-acting and dangerous.

Most agricultural colleges recommend the daily spreading of superphosphate in the manure of cattle barns to act as a deodorant and to lock in the nitrogen of the manure. Yet this practice sometimes causes a disease in cattle which actually eats away part of their hoofs. This is not to be confused with hoof-and-mouth disease. I recall when I first became interested in agriculture and attended some lectures on poultry-keeping, the professor advised the application of superphosphate in chicken dropping pits. The word *superphosphate* had a soothing, reassuring connotation. I thought of the innocuous phosphate drinks sold in ice-cream parlors and was convinced that superphosphate was good. But I have since changed my mind.

Dr. C. E. Greene in his amazing book "The Cancer Problem", (published by Greene & Son, Ltd., London) goes into very much detail as to the effects of sulphur in various industries in producing cancer. For example the chimney-sweep who is constantly in contact with sulphur in coal soot, heads the list of cancer sufferers, dying from this disease (1900-1902 figures) at the rate of 136 per 100,000 population. Tanners are at the bottom of the list with 33 deaths from cancer per 100,000. On the other hand furriers rate 111 per

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100,000. Dr. Greene states, "The tanner steeps his hides in lime, which is apparently a prophylactic, while the furrier adopts a different process. The skins of mammals, we are told, are best preserved by a mixture of 4 parts burnt alum to one part of saltpetre. Alum, it must be remembered, is composed of sulphuric acid, alumina, an alkali, and water. Nearly all furs have also to be dyed, and the mordant used is chiefly sulphuric acid.

"Most of the cheaper furs are cleaned with benzene, which is a coal tar product agitated with strong sulphuric acid. They are dyed with aniline dyes of the coal series, which are constantly produced by heating with sulphur."

Dr. Greene shows a list of about 58 occupations and it is most uncanny how the incidence of cancer deaths parallels the use or contact with sulphur in the various industries.

Cancer seems to be most frequent in cold countries. "The disease increases in frequency with remoteness from the equator to such an extent that in latitude 60° N the rate per 100,000 of the population is 105.7 in cities, whereas in latitude 10° N to 10° S the rate in representative cities is only 40.9." Dr. Greene explains why this is so. In the north, coal (which naturally contains sulphur) is used for heating. In the south very little is used.

He made a detailed study of the cancer statistics for every city, village and hamlet in France. It is remarkable how closely it follows the use of coal as a fuel. In a section where coal is the predominant fuel, cancer is higher than where wood is used. Cancer in the Northern section of France is much more frequent than in the South. Further north more fuel has to be burned. "In Nairnshire (Scotland)," says Dr. Greene, "cancer seems to be actually non-existent in the districts where nothing but a light non-sulphurous peat is burned, while it is very common in that part of the country where coal is used.

"In Orkney, again, cancer is common in a few districts where nothing but peat is burned when that peat is coal-like in character and has a very high sulphur percentage."

Dr. Greene noticed that some parts of London have constantly a death-rate from Cancer ten times greater than that of others. When he checked into it he found that it was due to the unevenness of the roof-line of the houses. In other words where all the houses are of about the same height the smoke can get away easily, but where there is a great variation in the roof-line, whirlpools and eddies of smoke occur, which send it into the homes and the cancer rate goes up.

Dr. Greene mentions the city of Erfurt, Germany, where the statistics show that professional gardeners suffer much more from skin cancers than the rest of the population. He states that it is due to handling infected earth. Germany was the originator of the whole chemical fertilizer idea and by far much more artificial fertilizers are used there than in the United States. Pre-war Germany extended over about 181,000 square miles. The United States covers over 3,000,000 square miles. Yet in 1928 Germany used 1,834,000 tons of fertilizers while we used 1,488,000 tons. There are two reasons for this. First, the Germans are a technically-trained people and the use of chemicals appeals to their way of life. This is to them the height of science. Secondly there are many chemical fertilizer deposits in Germany. Before World War I they controlled the entire world's potash business. It is just common-sense to figure out what is causing the trouble in Erfurt. The soil becomes saturated with poisonous chemicals and the constant handling of it may have a caustic effect on the skin.

This reminds me of an unusual item in "The Land," vol. 3, No. 2 (1944). In an article, "The Dirt Beneath Our Feet," Karl Menninger says "Belatedly we have discovered, of course, that a tremendous antibactericidal element is contained in the soil." (He refers to pennicillin). "When I was a child and worked on the farm and my uncle would cut his fingers and rub them in the dirt, I would tell my father. He was a physician, and he would shake his head and look half disgustedly and think, 'It is only a question of time until I have to amputate my brother-in-law's arm.' He never did amputate that arm and his brother-in-law got along all right with his wound sterilized by dirt, which I was religiously taught in medical school to take away from the patient immediately, regardless of how much pain it caused the individual to be scrubbed."

But the Germans in Erfurt got cancer of the skin from contact with a different kind of earth, an earth in which the chemicals had reduced the beneficient microbes to the vanishing point. Emil Ludwig in "The Nile" discussing native Egyptian women says, "just before the birth, she drags herself to the Nile and takes dry mud from the bank to eat in labour."

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That mud is the richest soil on earth. It is the overflow of the Nile and it contains valuable mineral and organic sediments gathered along the route of this famous river. There are no chemical fertilizer residues in that mud. Southern negroes in some localities seem to thrive on certain types of clay soils which they relish as a rare delicacy. No chemicals ever touched these clays, which "quiet de bellyache," say these negroes.

In canning, sulfites and sulphur dioxide are sometimes use as preservatives. In the first place if the necessary sanitary precautions are observed no preservatives are necessary. They are all strong substances, strong enough to kill micro-organisms and therefore strong enough to harm the human organism. Sulphur compounds should be especially avoided, for obvious reasons. They also destroy vitamin B1.

Coming back to Dr. Greene, as early as 1917 his book was published and probably for many years before that he was aware of the danger of using chemical fertilizers stating that where chemicals are dissolved in sulphur there might be trouble. More than half the artificial fertilizers are made with sulphur compounds including the popular ammonium sulphate. Gypsum contains large amounts of sulphur. Sulphur is also used to a great extent in spraying to protect against the inroads of insects.

Ammonium sulphate is a by-product in the manufacture of coke from coal. It is also obtained in the making of illuminating gas by distilling coal. It is such a strong substance that the U. S. Government (U. S. Dept. of Agric. Farmers' Bulletin No. 1569) recommends it for the purpose of killing off earthworms on golf putting greens. In the soil it tends to leave a residue of sulphuric acid, a strong poison. Yet it is an extremely popular fertilizer.

Calcium cyanamide is another very popular artificial fertilizer and in its manufacture, soft coal, very rich in sulphur, takes a very prominent part. Bear in "Soils and Fertilizers" (Wiley) says, "During hydrolysis to calcium hydroxide and urea, calcium cyanamide is toxic to plants. In using it special precautions must be taken, particularly on sandy soils." By hydrolysis is meant the decomposition of water. This takes place when the cyanamide comes in contact with soil moisture.

COAL ASHES

A discussion of sulphur compounds should include coal ashes. Many old-time gardeners swear by their use as a soil amendment. They are not a fertilizer but merely aerate heavy soils and improve the physical condition of the soil. Most authorities state that soft coal ashes should never be used as they are toxic to plants, but they all sing the praises of hard coal ashes. Actually it is merely a matter of degree. Soft coal ashes contain more sulphur. We do not recommend the use of either. If there is poor combustion in the furnace the ashes may then contain tar oils and metal oxides which are detrimental to soil life.

The railroads strew ashes along their rights-of-way to destroy vegetation. This of course is soft coal. In May 17, 1944 a bill was introduced into Congress to put the regulation of the manufacture of fertilizers under the jurisdiction of the U. S. Dept. of Agriculture. Under this law it would not be permitted to ship fertilizers in inter-state commerce that contained coal cinders. Recently tests were made at the Experiment Station at Geneva, N. Y. in the growing of tomatoes with hard coal ashes which gave an improved growth. But the trouble with these types of experiments is that improved growth is not the proper standard by which to measure. If the tomatoes absorbed some of the sulphur, or in some other manner were inferior from a nutritional standpoint, then what good is mere size. Secondly a one-season test is not sufficient.

The organic gardener has no need for coal ashes to aerate his soil. By means of compost he will soon build a spongy soil structure which will provide fine aeration. It might take several seasons but it will pay to wait. I cannot conceive of anyone who loves the soil polluting his garden with coarse ashes. Aeration might be achieved with peat moss or even sand. It might cost a little money but the gardener will be repaid by having a rich, dark, soft, smooth soil which he will love to run his hands through.

One of the readers of Organic Gardening had a most unusual experience with regard to the effect of soft coal on earthworms. Mr. James W. Spring, Jr., of Scituate, Mass., writes, "I am now doing green-house work and raising carnations. We had to put all the flats containing the carnation cuttings outside the house wherever there was space. Now, some of these flats were on the footpath leading to the house, some on a space where the soft coal for the boiler had been dumped and all the grass killed and some on the lawn where the grass is good and thick. Due

to the usual reason this year, labor shortage, we let the flats sit longer than we intended to. These flats were kept constantly dampened down with the hose to keep the carnation cuttings soft.

"This morning we finally got the bed ready and started to plant. Having earthworms in mind I was watching each flat as the boys turned out the plants. Queer thing, — there were no worms in the containers in which the plants had died. These plants, incidentally were in individual containers having four sides but no bottoms. The first few flats didn't have an earthworm. Then a flat came along which was loaded with earthworms. This continued for quite a while and I figured we were getting about three worms per plant. Wondering just what was happening, I went out to the flats outside the building and found that the ones on the grass were the ones with the worms and the ones from the coal heap the ones with no worms.

"Seeing that the flats had been sitting out for about a month and that the weather had been hot and dry all this time, the worms had sought moisture and had come up from the earth into the flats. Of course, the coal heap had no worms, hence no worms were in the flats from that location."

Not only the sulphur but potash in chemical fertilizers are corrosive and poisonous. Caustic soda or potash may cause fatal burns or blindness. Most artificial fertilizers are acid in their nature and acids are usually strong enough to dissolve metals. Nitro-phosphates are highly corrosive.

Ammonia is a common ingredient in fertilizers. In the early part of 1944 a butcher, George W. Kleckner, of Allentown, Pa. died from the effect of inhaling ammonia fumes from a refrigerator he was repairing. The Shell Chemical Co. of California recently worked out a process by which ammonia is bubbled into irrigation ditches. They also feed it directly into the soil as a gas from steel cylinders. The farmer pays according to a reading from a meter. I wouldn't want to eat food raised in this manner but would rather depend on nature's method of producing ammonia from organic manures and other residues. This artificial shot-in-the-arm shoots up yields at the expense of quality. Unfortunately it is also cheaper than the regular commercial fertilizers and will thus encourage farmers to overdo it.

F. C. King, in a recent article in Organic Gardening draws attention to the poisonous nature of potassic fertilizers. He says, "I should like to say a little about potassic manures. The chief source of supply of potash salts is Germany. These are marketed as kainit, muriate of potash, sulphate of potash, etc., but as they all come from the same mine, though they vary considerably in price, there is little to choose between them. The difference in price is merely a question of the quantity of impurities they contain. The higher the price per hundredweight, the less the impurities, but at best, as in the case of muriate and sulphate, they contain more than fifty per cent impurities, while in the case of kainit the percentage of waste is 88 per cent. It should be clearly understood that these impurities are very detrimental to plant life and are, in fact, definitely poisonous in most cases. For the most part they are too dangerous for amateurs to use, although forms of potash are constantly being recommended for such crops as Onions and Tomatoes."

In a recent issue of the "Eastern States Cooperator" appears the following, "Almost every nitrogen carrier has some disadvantages. The more soluble carriers all have some tendency to pick up moisture and become difficult to distribute in rainy or humid weather. Some of them are considered a fire hazard. No mineral nitrogen carrier should be left around carelessly where l i v e s t o c k might nose into it because it is toxic to animals."

Ammonium nitrate is a chemical fertilizer which will explode if it receives a strong detonation. While the chance of an explosion is one in a million, I wouldn't want to have stuff like that around my barn. Bags in which this material has been stored are inflamable and the manufacturers usually advise that they should be destroyed as soon as emptied.

There are rare trace elements in the soil which Nature, the perfect laboratory technician, knows how to handle. They include boron, fluorine, silicon, iodine, cobalt, chlorine, etc. These elements seem to be needed in extremely small quantities, a small oversupply being toxic to plants and animals. Where organic fertilizers are used there never is a question of trace elements, the crop rarely showing any of the deficiencies which the practiced eye can note where some trace element, such as boron for example, is absent. Of late, chemical fertilizer manufacturers have been playing around with these trace elements, adding them here and there to fertilizers, but in view of the dangers

of an oversupply causing toxicity, a farmer should go easy before using them.

In concluding I want to give a simple example of how a chemical will inhibit plant growth. In this case the chemical is seaspray which is much more mild than many of our chemical fertilizers. It is a note in the Bulletin of the Torrey Botany Club, Volue 65, page 485 (1938) as follows: " The tendency of many woody plants on seacoasts to show a sloping form of growth with the main stem pointing at an angle away from the sea has previously been thought to be due to the force of the prevailing winds—hence the term generally applied to the form of such trees, "windform". Wells and Shunk of the North Carolina State College of Agriculture and University of North Carolina, show that, at least on seacoast areas, this is not due to the force of the wind but of seaspray deposited upon the young shoots on the seaward side of the plant: this spray prevents growth on that side of the tree. The effect is therefore not physical in nature but chemical, and the term "wind-form" should be replaced by "spray-form." This is mentioned to show the corrosiveness of sea salts which are far milder than chemical fertilizers.

J. I. RODALE.

MULCHING

From The COUNTRY GENTLEMAN

MULCHING increased yields of apples as much as 100 per cent in some cases in experiments carried on at the Massachusetts Station for more than 20 years. With McIntosh, the average annual yield for cultivated trees over a 20-year period has been approximately 7.2 bushels each, while mulched trees have produced 10.8 bushels. Corresponding figures for Wealthy were 7.2 and 9.9 bushels. Cultivated plots were given nitrogen and potash; mulched plots had nothing but hay mulch.

Another mulching test was started in 1938 with a block of ten mature McItosh trees which had been cultivated for about 20 years and had received no fertilizer treatment. The trees were in poor vigor when the first mulch was applied to the bare soil in midsummer. Striking improvement in the trees was evident the following summer, and by 1941-42 yields increased almost 100 per cent. In those two years the mulched trees yielded 50 per cent more than similar neighboring trees in sod which had received mineral fertilizers regularly.

Still another mulching test was begun in 1940 in a 12-year-old McIntosh orchard when poor hay was applied to some areas under cultivation. The rest of the orchard was in ladino sod annually fertilized with applications of nitrogen and potash.

As early as 1942 the mulched trees, without other fertilizer, were growing better and fruiting more heavily than the other trees. The hay mulch alone seemed to supply more favorable conditions for tree growth and production than did the fertilized ladino-clover sod.

Probable reasons for the excellent response of apple trees to hay mulching include a better and more constant water supply to the roots; improved aeration and general physical condition of the soil; a more liberal supply of available nutrients—particularly nitrogen and potassium, but other elements as well; and less variable soil temperatures.

When hay mulch is applied on cultivated orchard soil, beneficial effects appear sooner than when it is applied on sod. In no case has a nitrogen depression become evident, and in every case the mulch was used without added fertilizers.

In fact large amounts of mulch, such as six to eight tons of dry hay an acre a year, have occasionally caused excessive tree vigor. In such cases applications have been omitted for one or more years.

Several materials, such as straw, marsh hay, seaweed, chopped cornstalks, shredded banana fiber and leaves, may be used for mulching fruit trees, but ordinary cheap hay is as generally available and as satisfactory as any. It may be applied any time during the growing season. Mulching with hay, however, is not recommended as the one best method of commercial orchard soil management. It is probably more generally successful than any other single practice and in addition is recognized as an almost ideal soil conservation measure.—Lawrence Southwick.

(*Mr. Southwick is research assistant in the pomology department at Massachusetts State College.*)

SEAWEED

From "Country Life", England

IN agriculture seaweeds are of much value as food and manure. In some of the northern islands such as the Orkneys, the sheep are allowed to graze on the rocks at low water, and they and even cattle need no encouraging to search for seaweed delicacies. Sometimes weed is boiled and mixed with oatmeal as feed for calves. The weed is also dried and ground down, and in other cases made into a kind of silage, being stacked in alternate layers with hay. Experiments have proved that, fed regularly in small doses, seaweed meal improves health and fertility in cattle and chickens.

Along the coasts of Northwestern Europe generally the value of seaweed as manure is known. With the lack of other usually available fertilisers, greater use has been made of seaweeds since the war. Of the elements essential for the land, phosphorus, nitrogen and potash, the last is most scarce. Seaweed is a valuable source of potash, besides containing other salts and humus. There is not much nitrogenous value in seaweeds, but the different kinds of laver are said to be exceptional in this respect.

The weed is either burnt and scattered over the soil, or it is dug or ploughed in. In the Channel Islands the variety called varec is highly valued as a fertiliser. Some is spread directly on to the land, and some is dried and stacked to sell to farmers with heavy land who prefer it after this treatment. In the west of England, Ireland, and Scotland, weed is largely used for manuring potatoes. The Scottish crofters gather the weed in creels, which are loaded into a boat. It requires 30 creels for a boatload, and six boatloads are wanted for the average potato patch.

Of recent research, brought about by the war that related to the production of agar-agar is perhaps the most notable. It was believed that the particular weeds from which this could be produced were rare round the shores of these islands, but several lots were found in Eire and the Emergency Scientific Research Bureau has been carrying out a complete survey to discover others. Nearly £1,000 was paid for weed last year and Irish agar-agar will soon be marketed. Whether it will be able to compete in price with the Eastern product when things are normal remains to be seen.

CUTWORMS AND MANURE

While in Texas recently, I was told by good gardeners in several parts of the state that plants fertilized with chicken manure are never touched by cutworms, no matter how great the infestation in adjoining parts of the same garden. If a similar thing should prove true in other parts of the country, and a testing in individual gardens is the easiest way of testing the matter, gardeners who keep poultry might well find it worth while to use fertilizer from their flocks on crops most likely to be attacked by cutworms.—Maud R. Jacobs, South Carrollton, Ky.—*Horticulture.*

SEED SWAPPING

Have you ever thought of having a Seed Exchange among members? Let's say that anyone having seeds of their own gathering from plants of at least three generations of compost culture could write in and say what he had and then swap with another subscriber? (That gives me two years to go, worse luck!) —J. W. Spring, Jr., Scituate Center, Mass. —Ed. Sounds like an excellent idea.

Hints For The Victory Gardener

This is the twenty-first of a series of articles by this author dealing with the cultivation of ordinary vegetables.

BY ROGER W. SMITH

SUNFLOWERS

A FEW giant annual sunflowers to brighten a corner and to supply food for the wild birds; to such obscurity has the sunflower sunk. In ancient times it ranked with corn and potatoes; it took the place of flax and wheat flour. Your admiration for its immense and brilliant flowerhead and your desire to grow it may well be a subconcious realization of its long forgotten values.

The annual sunflower, *Helianthus annus,* is a genuine American native. It is very closely related to another valuable but neglected plant, *Helianthus tuberosus,* the girasole or Jerusalem artichoke. The annual sunflower forms a very large edible seed head. The perennial sunflower produces many edible roots. Both of these plants were long cultivated and improved by ancient Indians and their efforts, as represented by these modern plant forms, are passed along to you, the modern gardener.

You will find the annual sunflower easy to grow. It will thrive if you provide it with no more than a modicum of its necessities; open, well-drained soil and plenty of sunshine. Both the annual sunflower and its root producing relative, the perennial sunflower, are very stout native herbs. They remain little different from their wild ancestors. They have thick stalks and rough leaves which usually stand up under adverse climatic conditions and are very resistant to both insect pests and plant disease.

All too often, however, sunflower seed is very thickly sown in poor soil with a result that the crowded plants fail to form normally. This failure is especially noticeable in the size of the flowerhead and the size and quality of the seed.

Each plant forms a very extensive and rather rapid growth both above and below ground and because of this you will naturally allow ample space for the tall and spreading growth. A good plan is to space the rows about four feet apart and sow the seed about two feet apart in the row. The seed, which is usually viable, should not be sown until danger of frost has passed and the soil thoroughly warmed up.

Because this plant makes a relatively enormous growth during a rather short period, you will readily understand that it cannot do this and mature its very heavy crop of seed without an ample amount of readily available plant food. The best way to supply this demand is to incorporate with the soil in which the plant is to grow a generous amount of organic humus brought from your compost heap.

Along the rows where the plants are to stand, a six inch layer of mature compost humus should be dug-in before planting the seed. Well rotted manure may be used if necessary but in making the substitution you will remember that some time will likely have to elapse before this material becomes as readily available to the plants as properly composted organic matter.

Although it is not absolutely necessary, it is a good plan to make some arrangement for the support of the tall, flower-bearing stalks to prevent them being beaten down to the ground by high winds just before the seed heads ripen. Almost any arrangement of stakes and string placed along the rows will help. Some practical gardeners plant sunflowers along a fence row and give them support by only a minimum of light tying with strings.

Wild birds understand the real health value of sunflower seeds. So when you approach the problem of harvesting the seed you will do well to note the time when the birds begin to pick out the seed around the rim of the head. Naturally, the outer seeds mature earlier than those nearer the

center of the head. Just as soon as about two-thirds of the seeds are well filled, the head may be gathered. If you wait for the center seeds to fill out you may lose the outer ones. The easiest way to harvest this crop is to cut off the heads with a foot or two of the stalks attached and hang them up in an airy, dry place to cure before attempting to separate the seeds from the husks.

Much later, after the rush of harvesting your other garden crops is over, you may remember your collection of sunflower seed-heads hung to dry in the attic. The rough stalks have become brittle by now. The fat seeds separate easily as you run your thumb lightly over the surface of the head. They rattle like peas as they fall into the pan you have placed to catch them. The sound gives you a feeling of satisfaction altogether out of proportion to what you thought was the value of the seed being gathered—winter food for the wild birds. You peel a few of the seeds, nibble on them and find them quite palatable.

By parching and pounding this same seed the American Indian made a meal, considered by him, equal to cornmeal. From sunflower seed he extracted a valuable, edible oil—equal to corn oil—and after this oil had been extracted the remaining seed cake was valuable as fodder for his animals. From the pounded petals he extracted a yellow dye; from the fibers of the stalks he succeeded in weaving a cloth almost as fine as silk; its foliage fed his animals.

It is probable that the sunflower was more important in feeding and clothing many an aboriginal Indian than any other plant. Its ability to withstand drought must have brought it admiration. The Incas of Peru wrought exquisite replicas of sunflowers out of solid gold for use during ceremonials.

The growing and harvesting of a supply of sunflower seed will have served as your introduction to a very interesting plant. But whether you learn to admire it because of the fine flavor of its health giving seed or because of the effort it makes to always keep its flower facing the sun, you will surely eventually come to love and respect it.

Subsoiling

IN regard to the Killefer Chisel, it is a very interesting machine, requiring a lot of power to pull it. I use an RD-6 Caterpillar tractor, having 45 Drawbar H.P. and it is all it will do. This machine has seven blades that are adjustable and I have been using five blades. They go into the ground 18" to 24" and facture the soil, loosening it and virtually raising it 6". It does not, however, turn over the top soil. This tends to aeriate the soil, giving it room for the storage of water in hill ground. I have been using the chisel in the heavy, gumbo ground of our Drainage District. It is used to get rid of excess water that has a tendency to stand in fields throughout the summer.

It is interesting to note that some so-called ponds which have always had water the year around, are dry this year during the highest water we have had for one hundred years. A lot of this ground was sour from having water on it most of the time. It now works more easily and we have gotten rid of the sourness.

Of course, I am not able to use the chisel all of the time, but only in dry weather. The last two years we have had considerable rain and we have been forced to plow before we could put in our beans and corn and this ground does not get chiseled until it is rotated and becomes wheat or oats ground. Later in the summer, after wheat or oats harvest, the ground is usually dry enough to chisel. After we chisel, we use a disc to work up the seed bed.

I ran across the chisel in California and I believe they are far ahead of any state in the union on farming, as a whole. One can see many interesting machines that are used only there, and with very good results.

Carrot

With graceful net of leaves like ferns—
The carrot gathers sun and rain—
Then by some alchemy he turns
All this to gold—and so we gain
The vitamins and flavors rare
That add much to our daily fare.
We take it all and give no thought—
To why the miracle was wrought.
The carrot had a different plan
Unlinked to services to man—
He slowly built through patient hours
A golden hoard to spend on flowers.
We freeze his assets--rob his banks
And never even offer thanks.
—L. Young Correthers.
"These Blooming Edibles".

Water Where You Want It
When You Want It

BY CARROLL P. STREETER

"TO prevent a flood you just keep so much water from ever getting to the river," says W. C. "Bill" Etheridge, head of the farm crops department at the University of Missouri. "That's just plain country thinking."

And how do you think he proposes to do it? With two, three or a half-dozen good deep ponds on every upland farm. He wants 500,000 of them in Missouri alone—in addition, of course, to such better-known soil-saving methods as terracing, contouring, dams across gullies, keeping ground covered, and woodlots strategically placed.

Missouri farmers have already built 25,000 of these ponds. In addition to anything such ponds may do toward flood control, they provide livestock water all over the farm, making it possible to rotate stock from one field to another, the same as crops. Sometimes they irrigate gardens, and they provide fishing and swimming for thousands of farm families.

Any farmer who has slope enough to his land, and whose soil will hold water, can use the idea.

Ponds, Not Puddles

The first thing to realize is that not every puddle is a pond. Ten years ago many a so-called pond was a nuisance—a shallow, scummy, stinking, mosquito-breeding place. Livestock waded in it, muddying the water and leaving it full of parasites.

The University of Missouri is changing that, thanks to its agricultural engineers, particularly Marion W. Clark. Here is the kind of ponds that Etheridge and Clark and the Missouri Conservation Commission are suggesting that Missouri farmers build:

1. They are deep (8 to 16 feet) and are small in area (usually ¼ to ½ acre). This keeps down seepage and evaporation. Often such a pond never goes down more than two feet, even in a dry year, and *it never dries up.*

2. The sides are properly sloped—and the earth dam across the bottom is built to specifications.

3. Livestock is fenced out. Clean water from this protected supply is piped through the pond bank to one or more tanks below the pond. Oftentimes they are located where fields join, or corner.

Stored Up the Hill

4. The ponds are located high enough up the hill to allow piping the water to places where it can be used. "We still have to fight the man who thinks the place for a pond is at the bottom of the hill or at the lower end of a gully," Clark says: "Some farmers pipe water downhill to the barn and even to the house (for everything but drinking water). 'Why drill a well, they say, when rain-water will do?'"

5. The area drained by any one pond is strictly limited—usually to 12 acres or so. Instead of making ponds bigger you have more of them. That way you can get by with grass spillways instead of expensive concrete ones, or you can empty into a terrace. You do not drain water from the next farm or from a highway traveled by livestock trucks, and thus you help prevent diseases and parasites.

These grass spillways, incidentally, are well-sodded inclines, often with terraces emptying in from both sides, located, if possible, so they need never be crossed in farming the land, and wide enough to cut for hay.

6. The water drained into the ponds comes only from clean

meadow or pasture, or from terraced land with good grass outlets. *No silt washes in.*

7. The edges of the pond are planted to trees, shrubs and aquatic plants, to protect the banks from wave action, to furnish food for fish and wild fowl, and to make more pleasant recreation spots. The Missouri Conservation Commission furnishes planting material at cost (400 trees and shrubs for $2) and stocks the ponds free with such fish as bluegill, sunfish, catfish, crappies and black bass. Farm boys in Missouri no longer need to hunt up a river or "crick." There's plenty of swimming and fishing right on the farm.

Consider the benefit of livestock water alone. How often farmers leave pastures in one place for twenty years or more, just because a creek or a well gives them water there! The old pastures get weedy and full of parasites. But not on Missouri's ponded farms. With two to eight ponds around the farm, farmers can pasture livestock almost anywhere. That puts grass, and manure, all over the place. And it means enough pasture so the stock can't eat it bare by August.

No More Hauling Water

"There's never a year," says Bill Etheridge, "when farmers in some parts of Missouri don't have to haul water. Sometimes, as in 1936, they have had to ship it from the nearest river by tank car. Too many of them have been depending on the 'branch.' Ponds can give them both water and feed."

How big, and how many, ponds does a farmer need? The University of Missouri, Columbia, Missouri, has an excellent free bulletin, "Farm Ponds in Missouri, Circular 482," which answers that question, and shows in detail how to build good ponds. Send for it. Marion Clark, author, says this:

"Livestock on an average farm —the equivalent of 65 cows— takes 60,000 gallons of water a year. Since half the water will seep away or evaporate, plan for 120,000 gallons. You can get this in a pond 73 feet in diameter at the spillway level, eight feet deep, and with banks sloped to give a 25-foot diameter at the bottom. Such a pond costs from $50 to $200.

Farmers and Floods

Not many weeks ago rivers of the Midwest flooded hundreds of thousands of good farm lands, tore up levees, washed away roads, carried off small bridges. Damage was estimated at fifty million dollars in Missouri alone.

Yet, says the U. S. Soil Conservation Service, in any such flood the loss from soil erosion is four times, and from fertility loss six times, the damage done by the river. Most of the damage is done before the water ever gets to the river.

"What we have to learn," says Bill Etheridge, "is that *farmers must team up with river engineers* or we'll never lick the floods. It's a two-handed job.

"Dams can't do it alone. They fill up with silt. When a dam is half full of mud it can't hold more than a half-dam full of water. That's why we have been building bigger and higher levees in a hopeless contest, until now some of our rivers, flowing between levees, are actually above the surrounding countryside. Power dams are the most futile of all for flood control—they're already full of water before the flood comes.

"Now if a big dam will hold back flood waters, why won't a lot of little ones? The 500,000 big farm ponds we want in Missouri would hold six to eight times as much water as the Bagnell dam on the Osage River—the biggest in our state."

Yes, the ponds would hold a lot, but it is the grass they would produce, through livestock farming, that would be the real flood control. It controls erosion, too.

Careful measurements on three fields at a federal experiment station at LaCrosse, Wisconsin, showed that on land cropped continuously to corn the top seven inches of soil would wash away in just eleven years. On a field planted to corn, barley and clover, in rotation, it would take 40 years to lose these seven inches, but on blue-grass it would take 53,000 *years*. At this rate there would be no soil loss from the blue-grass fields at all, for the grass would build new top soil as fast as it would be lost.

Grass makes a spongy surface, that soaks up rain. Loose, plowed soil on a slope fairly melts away. It accounts for a sizeable volume of the flood water. "From 10% to 30% of a muddy river in flood is nothing but the farms going by," says Marion Clark.

With the end of the war we can do something important with this idea. The government will have great quantities of dirt-moving machinery, which it could make available to pond-building contractors. We will also have a lot of farm and small-town boys back from the war, mechanically trained and looking for employment.

"If we went at pond-building on an assembly-line principle we could cut the cost of a quarter-acre to half-acre pond to $75," Etheridge says.

"Given time enough many farmers would build such ponds themselves, but time is short and delay is costly. Our soil is washing away at an alarming rate.

Once it's gone to the Gulf we can't bring it back. What we need is ponds—and all the other means of soil conservation—on 75% to 90% of our farms *right now.*

This Money Comes Back

"That means federal aid. And why not? Water arising in one state may flood another. Our soil is a public concern, too. Everybody depends on it. We have spent two billion dollars building dams, just for flood *protection.* Why not spend a fraction of that amount, not only to prevent floods but to protect the soil, and actually to improve it? Unlike our expenditure for dams, this money would come back to us, and it wouldn't take long."

Senator Clark of Missouri has introduced a flood control bill which authorizes appropriations for soil conservation as well as dam-building. Whether or not this bill ever passes, we may be about to make a start toward keeping the water back on our hillsides where we can use it. And not only the water, but the farms themselves.

The Value of Manure in Sugar Beet Black Root

Reprinted from "SUGAR" June 1944

BY DR. H. C. YOUNG
Chief, Dept. of Plant Pathology, Ohio Agricultural Station.

THE control of a root rot disease is usually difficult. Soil disinfectants are effective, but the cost is too high for most crops. Consequently, it is necessary to look to other factors and methods. The relationship of the host to the parasite must be studied. The margin of resistance or the factors affecting resistance must be determined. With root rots caused by specific organisms, a breeding program is effective. With a problem such as we have with black root of beets, in which many organisms are concerned, a breeding program is much more complicated. The way out seems to be through cultural practices, such as the building up of the organic content, balancing of the nutrients, replacing depleted elements, and in general regulating the physical complex and flora of the soil. The correcting of the factors that have caused the tremendous increase in the number and severity of root rots seems to be the logical method of procedure.

The role of organic matter in the heavy beet soils in northwestern Ohio has been extensively studied, particularly during the past four or five years. It has been shown that many of these soils are extremely low in organic matter, and that because of this the soil complex has changed. The water holding and porosity conditions have been lowered, the soil flora has changed, and along with all this, growing crops do not have the ability to make use of the nutritive elements present or applied as fertilizers. Twenty years ago 12 and 15-ton beet crops were harvested at Paulding and Holgate. These yields have gradually declined until three and four years ago they were in the neighborhood of 5 tons. During this same period, black root increased until it was considered unsafe to plant beets in many fields except after a very long rotation.

During the past three years, considerable organic matter has been replaced on the Holgate plots and the response in yield has been tremendous. A favorable change has taken place in porosity and the airholding capacity of the soil. Fertilizer applications are giving results. The incidence of black root is showing a definite decline. In 1938, in connection with some studies on the "damping off" of tomato seedlings in the greenhouse, it was found that an application of peat along with the seed checked the disease. The test was repeated with beets with similar results. Heavily infested soil was brought in from the Elmore section and similar plots were set up, except that other organic materials such as mucks and manures were added. The results were again favorable. Black root was greatly reduced. Soils from Holgate and Paulding were similarly tested but results were erratic. In 1940-41 and 1942 the tests were set up in the field and again the results were variable. There was an effect but it was not complete enough. However, all of the results from the greenhouse and field tests indicate that the application of organic matter is the first step in the control of black root.

How You Can Save $1.12 an Hour by Making Your Own Fertilizers

A series of articles by the famous leader of The School of Living, Suffern, N. Y.

BY RALPH BORSODI

Part 4

A CAREFUL estimate of the cost of fertilizing land for a standard five-year crop rotation of corn, oats, wheat, clover and timothy, indicates that the best modern scientific method costs about $64.39 per acre for the entire five-year period, or on an average about $12.88 per acre per year. An equally detailed study of the cost of using Sir Albert Howard's Indore Process for fertilizing the same land for the same crops, indicates that the total cost can be reduced to $43.92 or to an average of about $8.78 per acre per year. A net saving of fully $4.10 per year per acre can therefore be effected *without taking the superior quality of the Indore Process into account,* by abandoning the method of chemical fertilization in general use at present, and adopting the Indore Process. (Full details with regard to the manner in which these costs were determined are furnished in the Table and its footnotes).

Using average prices paid by farmers for fertilizers and lime, and using the farm-value of manure, the cost of materials for a fertilization plan recommended by the New Jersey Agricultural Experiment Station for this crop rotation amounted to about $45.27, whereas those used in the Indore Process require a cash outlay of only $17.25. If the manure is produced on the farm, however, and all hauling done by the farmer, the cash outlay in using commercial fertilizers amounts to only $19.75, while that involved in using the Indore Process would only amount to $2.75. This item, which is recommended for the purchase of lime, could also be eliminated, thus making it unnecessary to spend any cash at all with the Indore Process, if sufficient wood ashes or other neutralizing agents can be produced on the farm. Commercial fertilization therefore forces the farmer to increase his production of cash crops and to gamble upon the yield and market price to the extent of something between $3.30 and $6.40 per year per acre, depending upon whether he produces his own manure or figures as if he had to buy it.

The cost of labor, horse-work and equipment required with commercial fertilization is relatively easy to determine since detailed cost records have been kept and adequately reported. While numerous cost records on the Indore Process are available, these records have been made where material, labor and cultivation conditions are very different from our own. Based on the study of those reported cost records and upon the practical experience of gardeners composting in this country, it is estimated that the gathering and composting of 20 tons of material required by the Indore Process requires a maximum of 40 hours of labor. If the composted material is spread on the land in two applications as recommended, the labor and horse-work will be approximately twice that required to spread 10 tons of manure. The total labor, horse-work and equipment cost for the Indore Process will therefore be considerably greater than for the methods involving the use of chemical fertilizers. A comparison of the final result, however, indicates that a net saving of about $20.47, or about $4.10 per year per acre, would still be effected by the use of the Indore Process. (1) According to Table 1, it would take about 61 hours of labor to use the Indore Process as compared with only 36.3 hours for performing the equivalent work using commercial fertilizers. If the 24.7 extra hours of labor required are divided by the savings of $27.87

(exclusive of labor), this means that a farmer using the Indore Process would save money at the rate of $1.12 per hour for each hour devoted to making fertilizer at home *without taking its superior qualities into account* and without making any allowances for the savings of cost in plowing, harrowing, cultivating, spraying, etc., with the Indore Process.

It is difficult to exaggerate the importance of these possible savings to the farmers of the United States. It is quite possible for this one change in farming practice—substituting the right practice for the wrong practice in fertilization—to insure the prosperity of American agriculture, other things being equal.

Expenditures for fertilizers for farms and gardens have become very large. Yet few farmers and gardeners are buying the quantities recommended by the manufacturers who make and sell fertilizers and the soil scientists who recommend their use. If the use of chemical fertilizers is really necessary in order to maintain the productivity of our soils, expenditures for this purpose must be enormously increased.

The purchase of chemical fertilizers in large volume began about the year 1880. Yet productivity of farm land has not increased during that time. This fact throws doubt upon the claims for the efficacy of chemical and inorganic fertilizers. The coming of erosion, of dust bowls, or lower water-tables, etc., throws further doubt upon the value of the existing program of fertilization. Finally, the alarming increase in plant and animal diseases and in insect and fungous infestation, raises still more doubts.

From the economic standpoint, the cash expenditure — which drives the farmer to raise larger crops in order to secure this cash —is enormously important. Since the farmer's margin of cash returned on each bushel or unit produced is very small, he may have to raise and throw on the market $10 worth of crop in order to get the margin or "profit" in cash necessary to pay for $1 worth of fertilizer. The farmer, therefore, is doubly handicapped by this outgo—it adds to his expenses, and at the same time it depresses the price received per bushel for what he sells by forcing him to raise and sell many times more in cash crops than he expends for fertilizers. A careful estimate of the amount spent by the farmers of this country for chemical and commercial fertilizers during the last 60 years is presented in Table 4. About $200,000,000 has been spent annually in recent years to buy between six and eight million tons of commercial fertilizer materials and mixed fertilizers, exclusive of liming substances and other soil amendments obtained by farmers directly from producers. A general increase in yields per acre, per farm and per man was expected to provide farmers with the cash with which to pay for these chemicals. But no such increases have developed after over a century of mineral fertilization. Farmers as a whole have had, therefore, to increase the acreage cultivated by them in order to pay for this increase in their costs of production.

If we assume that they have had to raise only $5 worth of cash crops in order to secure a net $1 with which to pay for $1 worth of fertilizers, then they must now be throwing a billion dollars worth of cash crops on the market yearly merely in order to help support the fertilizer industry. It is obvious that the addition of anything like a billion dollars worth production to the annual surplus of corn, wheat, cotton and other cash crops must play a great part in the constant tendency of agricultural surpluses to depress farm prices. It is also obvious that if there is no real necessity for farmers to buy these chemicals, they would not only save the money and effort put into raising the crops to pay for them, but would also avoid the losses caused by the extra-depressing force exerted on the agricultural prices of all the crops which they raise to sell.

Experiments and studies made by the School of Living indicate that it is unnecessary for farmers and gardeners to use chemical and commercial fertilizers; that it is possible for them to manufacture all the fertilizers they need on their own farms in order to maintain the full productivity of their soils, and that there are many qualitative benefits which would also accompany the change.

A comprehensive comparison has been made by the Research Division of the School of Living, of the cost of fertilizing one acre of land for a 5-year crop rotation by methods now recommended by authorities advocating the use of commercial fertilizers, and the cost of fertilizing the same acre of land by the Indore process as developed by Sir Albert Howard. The comparison shows that it is possible to save $1.12 an hour by abandoning the use of chemical fertilizers and adopting the Indore process of fertilizing with home-made, organic composts.

(1) An actual comparison of the difference in fertilizer cost per acre between the Indore Process and commercial fertilizers was made at a hop garden in Sussex, England. The cost of preparing and caring for compost and spreading it on the land came to 10s. per ton or £8 per acre. The purchase, hauling and spreading of the equivalent NPK content in the form of sulphate of ammonia, basic slag, and muriate of potash would have cost £9. 12s. 7 1-2d. per acre. The total amount saved per acre was therefore £1. 12s. 7 1-2d. This is a saving nearly 50% higher than that estimated in Table 1.

Table 1.

	Cost of Using Commercial Fertilizers (11)		Cost of Using the Indore Process (13)	
	Quantity	Cost	Quantity	Cost
Materials:				
20% Superphosphate (1)	450 lbs.	$4.68		
Sulphate of Ammonia (1)	250 lbs.	4.64		
3-12-6 Fertilizer (1)	300 lbs.	4.45		
Agricultural Limestone (2)	1 ton	5.50	1/2 ton	$2.75
Hauling to Farm (3)	1 1/2 tons	1.50	1/2 ton	.50
Manure (4)	14 tons	24.50		
Manure and Plant Compost (5)			20 tons	14.00
Cost of Materials		$45.27 (12)		$17.25 (13)
Horse work:				
Spreading Manure/Compost (6)	28 hrs.	$5.04	40 hrs.	$7.20
Applying Fertilizer (6)	8.6 hrs.	1.56	2 hrs.	.36
Equipment Overhead Cost (7)		1.62		.81
Cost Except Labor		$53.49 (12)		$25.62 (13)
Saving to Offset 24.7 Extra Hours of Labor with the Indore Process, $27.87. This means that the saving per hour in the extra time is at the rate of $1.12. (8).				
Labor:				
Spreading Manure/Compost (6)	14 hrs.	$4.20	20 hrs.	$6.00
Applying Fertilizer (6)	4.3 hrs.	1.30	1 hr.	.30
Preparing Compost (9)			40 hrs.	12.00
Value of Destruction of Trash Used for Plant Compost (10)	18 hrs.	5.40		
Cost in Hours of Labor	36.3 hrs. (12)		61 hrs. (13)	
Total Cost in Money	$64.39 (12)			$43.92 (13)

(1) Average retail prices in ton lots in New York State for 1936-1940 according to N. Y. Coop. G. L. F. Soil Service was, 20% Superphosphate, $20.75; Sulphate of Ammonia, $37.10; 3-12-6 Fertilizer, $29.64; 5-20-2 Fertilizer, $35.26. (This last was recommended in the plan prepared by authorities at N. Y. State Agr. College).

(2) Average retail price of Agricultural Limestone in ton lots in 1940 was about $5.50 according to N. Y. Coop. G. L. F. Soil Service.

(3) Cost of hauling lime and fertilizer from dealer to farm estimated at $1.00 per ton.

(4) Cost of manure estimated at $1.75 per ton on the basis of "Costs and Returns from Farm Enterprises, 1938," N. Y. State College of Agr.

(5) The 20 tons of compost recommended for use with the Indore method, is composed of 8 tons of manure. According to directions published in the "Journal of the Royal Society of Art," Nov. 22, 1935, and Chapter IV of "An Agricultural Testament," Sir Albert Howard. The balance of 12 tons may consist of any kind of plant waste, and the cost of collecting this waste on the farm is included in items under the heading of Horse Work and Labor.

(6) Based on estimates of the Bur. of Agr. Econ., U. S. Dept. of Agr., one man-hour and two horse-hours are required to apply one ton of manure by spreader. The same time is required to make a single application of fertilizer with two-row equipment. Labor is valued at 30 cents an hour and horse work at 18 cents an hour on the basis of "Farm Cost Accounts, 1939," N. Y. State College of Agr.

(7) The cost of using manure spreaders and fertilizer drills is estimated at one-third of the amount shown for all cultivation equipment on the basis of reports in Cornell Bulletin 422.

(8) The saving of $27.87 is the difference between all costs (except labor) by the Indore process, ($25.62), and the cost of using commercial fertilizers, ($53.49). The 24.7 hours of extra labor needed with the Indore process is the difference between the number of hours used with the Indore process, (61 hours), and the number of hours required to perform identical work when using commercial fertilizers, (36.3 hours).

(9) It requires about 3 hours per ton to gather and compost vegetable and plant wastes on the basis of experience with plant composts at the Threefold Farm, Spring Valley, N. Y., and on the basis of costs of composting by the Indore process in Sussex, England, and Travancore and Nairobi, South Africa. The cost of handling manure is estimated at 15 cents per ton (½hour of labor) more by the Indore process than by ordinary methods, although it has been suggested by two compost authorities that any additional time used to handle and compost manure is offset by the shorter time required to spread fully decomposed material.

(10) This is an estimate of the cost and value of cutting weeds, destroying trash, raking leaves, burning straw stacks, etc., if this work were done instead of using the materials for composting. This cleaning operation is estimated at 45 cents per ton or 1½ hours of labor.

(11) The cost of using commercial fertilizers as shown in this table, is based upon estimates made by the Research Division of the School of Living of the cost of carrying out recommendations made by New Jersey State College of Agr., to the School for maintaining full fertility of one acre of land used for a 5-year crop rotation of corn, oats, wheat, clover and meadow hay.

(12) A less expensive program of fertilization recommended to the School by New York State College of Agr., would cost $36.20 for the following materials: 400 lbs. 20% Superphosphate, ($4.15); 400 lbs. 5-20-5 Fertilizer, ($7.65); 1 ton Agricultural Limestone, ($5.50); hauling 2,800 material to farm, ($1.40); 10 tons manure, ($17.50). Horse and equipment cost including 20 hrs. for spreading manure, ($3.60); 6 hrs. applying fertilizer, ($1.08); and equipment overhead, ($1.08), would bring the total cost of this program (for everything except labor) to $41.96. Labor required would be about 10 hrs. spreading manure ($3.00); 3 hrs. applying fertilizer, (90c); 18 hrs. destroying trash, ($5.40), bringing the total cost in money to $51.26. The difference in the money cost (excepting labor) is $16.34, making the saving between this plan and the Indore process 54.4c for each hour devoted to the home-manufacture of fertilizers.

(13) The Research Division of the School has also made an estimate of the cost of organic fertilization by the Bio-Dynamic method This method requires the use of two different kinds of composts—one made of manure and one made of vegetable waste—the use of two kinds of sprays, and the injection of 5 kinds of preparations into the composts. Total cost for the Bio-Dynamic method is estimated at $27.66 for 12 tons of manure compost, ($21.95); 6 tons of plant compost, ($1.06); 15 lbs. granulated lime, (60c); Bio-Dynamic preparations, ($4.05). Horse and equipment cost including 36 hrs. spreading compost, ($6.48); spraying, 11 hrs. ($1.98), and equipment overhead would bring the cost of this method (excepting labor) to $37.76. Labor required is about 54½ hours for spreading compost 18 hrs., ($5.40); preparing 12 tons manure compost 6 hrs., ($1.80); preparing 6 tons plant compost 18 hrs. ($5.40); applying preparations to composts 1½ hrs., (45c); spraying 11 hrs. ($3.30), bringing the total cost for everything involved in terms of money to $54.11. The difference in labor between the Bio-Dynamic method and the recommendations of New Jersey State College of Agr., amounts to 18.1 hrs., and the money cost (except for labor) is $15.73 less, making the saving by the Bio-Dynamic method 86.4c an hour for each hour of extra labor involved.

If the Bio-Dynamic method is compared with the less costly method of using commercial fertilizers recommended by New York State College of Agr., the difference in labor involves extra labor of 23½ hours while the money cost (for everything except labor) is $4.20 less, making the saving by the Bio-Dynamic method 17.9c for each hour devoted to the home-manufacture of fertilizers.

Is Modern Agriculture On The Right Path?

RECENTLY I received a copy of a small pamphlet entitled—"Is Modern Agriculture on the Right Path?—A quest for a Finer Rural Culture". It was written by Paul K. Keene, former manager of the School of Living, and later a member of Kimberton Farms School. Mr. Keene is a present farmer-manager on a large farm in Chester County, but he expects shortly to start work on a small experimental farm, run entirely by organic methods.

The thesis of the pamphlet is to the effect that agriculture must be more than a business or an industry—it must be a way of life, as such, it must be satisfying to those engaged in it. Mr. Keene studies the effects upon agriculture of modern trends, such as commercialization and industrialization, and finds that there is need for much unbiased study and investigation, as too often the net result is less satisfying than formerly. His recommendations are of interest to all who value the health of the soil as being fundamental to the health of the family and of the rural community.

Copies of this pamphlet may be obtained by sending 15 cents to Frank G. Chiles, Monacacy Park Road, Rt. 2, Bethlehem, Pa.

How To Harvest Sunflowers

THE U. S. Dept. of Agriculture in a bulletin entitled "The Sunflower: Its Culture and Uses" by A. F. Sievers states:

"Sunflowers grown for seed are generally harvested just before the seeds are quite ripe enough to shatter. This stage is reached about September 1 in California, September 10 to 15 in Missouri, and October 1 to 15 in Illinois. Various methods of harvesting and threshing are employed. Frequently a wagon with a tight box fitted with one high side-board is drawn alongside the rows, the heads are cut off with a stout, sharp knife, and thrown into the wagon box and against the side-board, whereby a large part of the seed is shelled out. A workman in the wagon uses a stout stick or curry-comb to remove any seed remaining in the head. In this manner three men usually harvest and thresh at least one acre a day. Sometimes a pea or small grain thresher is used to separate the seeds from the heads. Except with very small crops, the use of a machine will effect a large saving of time and labor in threshing. The seed is cleaned with a fanning mill, spread out on a floor, and turned at intervals until thoroughly dry, as new seed tends to become musty if stored in large quantities."

The following are three short excerpts from a bulletin "Special pamphlet No. 69" issued by the Agricutural Supplies Board, Ottawa, Canada:

"*Date of Harvesting.—The crop is considered mature when the backs of the heads are yellow and the outer bracts are beginning to turn brown.* At this stage the crop will stand heavy frosts without damage to the seed but there is too much moisture present in the seed for it to be stored safely if harvested. The crop should be allowed to stand until the back of the heads and the seed is well dried. The drying process usually requires from three to four weeks after the mature stage is reached. At Saskatoon the Mennonite material has been ready to harvest between September 20 and October 1 in most years.

* * *

"The centre of most sunflower heads is comprised of hulls containing no kernels and these hulls are more difficult to remove. There is a definite advantage in not removing them in threshing as it is necessary to clean them out later. In examining heads to determine whether threshing is complete or not these hulls should not be mistaken for seed. Compared with the Mennonite, seed of the Sunrise variety is held more tightly but it has been found to thresh readily. If it is found that some good seed is being left in heads of this variety it is suggested that the cylinder spacing be closed up some before speed is increased.

* * *

Storage of Seed

"If the seed is well dried before harvesting there is no danger of heating or spoiling in storage. This has been indicated in data given in the section on time of harvest. The maximum moisture content for safe storage is probably about 11 per cent. By allowing the crop to stand in the field for some time after maturity in most years the moisture content will drop to below this figure."

* * *

Here are a few other notes found among some old clippings:

The harvesting task is equally simple. Little labor is required. When the seeds have reached maturity in the late summer, as is evidenced by the fall of some seeds from the heads, the latter are gathered. For curing, they are allowed to dry in the sun for a day or two. This further loosens the seeds so they may be shaken readily from the heads.

* * *

It has been found best to cut the sunflower heads off the stalk and place them singly on boards to dry for about two to three weeks. This drying facilitates the removal of the seed from the head by striking the head against some object or rubbing the head on a very coarse wire screen. For home use as poultry feed supplement, winnowing is not necessary.

* * *

Seed must not be stored in large quantity in a bin, as it soon becomes musty. When stored it should be turned over twice a week.

The Effect of Organic Mulch on The Growth of Grape Vines

BY ROGER W. SMITH

LAST fall we selected a group of some forty rooted Concord grape cuttings to determine as nearly as possible the exact effect a heavy mulching of organic materials would have upon their development. All cuttings were of the same parentage, had previously received the same treatment, and were practically identical.

Twelve cuttings were selected at random for use as a control. These were planted in the same soil within a few yards of the main group. They received the same drainage and sunshine but were given no other treatment except clean cultivation.

Before the main group was set out, however, a layer of about two inches of mature compost humus was lightly dug in. The plants were then set in place and given a mulching of about fourteen inches of well rotted leaves. The following figures give some idea of the growth made by the two groups by the first of July this year.

	Controls (Untreated except for clean cultivation)	Compost humus and mulch.
Average length of new growth (cane):	29"	68"
Average size of leaf:	4½" x 5½"	8" x 9½"
Average length of leaf stalk:	4"	6½"
Average distance between nodes:	3½"	5½"

In their general appearance the mulched vines are altogether superior to those unmulched. Whether they will bear fruit as heavily as they promise remains to be seen. They seem to be quite free from plant disease or serious insect pest. This is the more remarkable since ordinary vineyard practice calls for clean cultivation because it has been shown that most damaging molds and injurious insects overwinter in trash and fallen leaves to plague the vines the following year.

On the other hand, the Concord is very close to its ancestor the wild Labrusca a grape which thrives in the wild with its root system deeply covered by a layer of forest leaves, by a deep mulch of Nature's compost.

Lime And Earthworms

Dear Mr. Rodale:—

Relative to the merits of hydrated lime and ground limestone for the compost heap, will say this:

Hydrated lime must be used with care so far as earthworms are concerned. Too much will drive them out or kill them. Logically, probably the same can be said of bacteria of the soil.

On the other hand, ground limestone can be applied without danger of destroying or driving out the worms. In the case of ground limestone, the neutralizing lime is released very slowly, whereas use of hydrated lime is really a strong chemical treatment, to be used with care so as not to injure the organic life of the soil.

In the treatment of compost for quick results in transforming it for earthworm food, lime can be used to advantage. By treatment of the compost before it is impregnated with earthworms, the breaking down process is started quickly. Once the lime has been neutralized by chemical action on the composted elements, with dilution with water, then the danger to the earthworms and other life of the heap is obviated. In composting, the same can be said for the addition of moderate amounts of commercial fertilizers, particularly nitrates. They are very quickly broken down. However, on the whole, it is better to play safe and stick to organic methods. Quick results and quick profits are usually obtained at the expense of the soil.

Sincerely yours,
Dr. Thos. J. Barrett,
Earthmaster Farms,
Roscoe, Calif.

Reader's Correspondence

Please write on one side only. Do not make your letters too long. Put each different query on a separate sheet. Send stamped, self-addressed envelope for reply.

FLORIDA — TAMPALA

Dear Sir:

Two articles in recent issues of your publication were of great interest. One regarding the new vegetable introduction: "TAMPALA." This, it develops, is an ideal GREEN vegetable for growing in the summer in Florida. It is probably the only vegetable of its kind that will stand Florida climatic conditions in June, July, and August. This has interesting potentialities. I purchased a package of Tampala seed from Burpee and planted it on Jan. 30 of this year. It did well and we obtained a surprising quantity of greens from the small patch. Some of this same patch is still growing and making greens. Most of it, however, went to seed and to our surprise, a few weeks ago, we found it had reseeded itself and a large patch of Tampala was growing a short distance from the original patch. From this second patch we are now picking loads of fresh, tender greens. Under our hot, June sun and during the dry weather that has preceded our rainy season this is remarkable. A week ago I noticed a third patch of thousands of plants starting another short distance away from the original one.

The second item of interest was the article in your April 1944 issue on Sunflower Seed. This also because sunflowers will grow in Florida best during the hot summer months when so many other things cannot be grown.

Thos. W. Hewlett,
P. O. Box 1375,
Tampa, 1, Florida.

●

EARTHWORMS

Dear Sir:

I would like to have information on earthworms. If I buy *healthy red earthworms and put them in my land—If some earthworms turn pale later, what does it mean?*

My soil is acid but I've put some limestone on it. *Will limestone hurt earthworms* as acid soil without limestone would?

Miss Alice Sloan,
Roanoke, Va.

Answer

Dear Miss Sloan:

The subject of earthworms and agriculture is in its infancy. Very little is known about the color of earthworms and their effect on the soil. We had a big stack of corncobs on a piece of land for several years; it created a condition favorable to earthworms and the soil underneath just teemed with them. I noticed, however, that these worms were more or less white, whereas our regular earthworms right next to the heap were of a bluish hue. Evidently the condition of constant moisture on the corncobs turned them a different color.

A reasonable amount of limestone will not hurt earthworms,

Sunflower Seed Registry

We have received many requests from readers who desire to purchase sunflower seeds but not a single one from growers of organic sunflowers. A fair price to be paid to a grower for organic seeds would be 50 cents a pound, considering present day conditions. We ask no profit. We merely want to act as an intermediary. If you will have any to sell please write at once to

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rms,

but an unusually large amount might discourage them.

You asked about whether Sani-Soil is acid or lime. All plant matter is more or less acid. That is why, in the compost heap, we use lime to counteract it. If a field would be fallowed for many years, and the weeds continually cut down and allowed to decay, the fields would gradually become acid. It would then be necessary to give them a good dressing with lime.

●

FARMING — OLD FASHIONED

Dear Mr. Rodale:

The farmers around here all use the compost method of growing stuffs. They don't go to such extremes in making compost heaps, etc., but they mix their manure with dirt and trash and let it sit for a while before they spread it and plow it. One fellow has sold off 40 head of cattle because, with the help shortage, he can't grow his own feed and is damned if he will buy the "rotten" feed that is commercially grown.

The land is quite interesting around here. About a mile away, at the foot of a good slope is a river. Across the river is what is locally known as Duxbury mud, —sand and muck, sticky as the devil in wet weather and dry in the hot weather but it grows pretty good crops. On this side of the river the land is quite heavy near the river and then runs lighter as one comes up the slope, but no sand. *It has always been intelligently farmed,* which is more than I can say for most land around here. This being a big chicken raising section there is hen manure for the carting and as there is a big Sea-moss factory near at hand there is ton upon ton of waste sea weed. An interesting observation is that the two outstanding farms are run by men in their seventies who will have no part of commercial fertilizer. The poor farms are run by young men, mostly Portuguese, who use commercial fertilizer.

James W. Spring, Jr.,
Scituate Center, Mass.

●

MULCH — RAW LEAVES

Gentlemen:

For several years we saved all leaves and in fall covered perennials with them. To our disgust it called forth slugs in great quantities which ate every green shoot that came up.

Mrs. Clarence Hamlin,
Durand, Mich.

Answer

Dear Mrs. Hamlin:

We note your experience in the use of a leaf mulch. It would, of course, have been different had you composted the leaves first.

●

ORCHARDS — CATERPILLARS

Dear Sir:

In the March 1944 issue of Organic Gardening I read in the Editor's section a short article on the destruction of caterpillars in the orchard by burning with a torch. The article also referred to a possible heat destruction method without the use of a flame.

I am writing this letter so that you may experiment and pass on to others a method that I believe will destroy the caterpillars without a flame, heat, etc., and at the same time do no damage, I believe, to the trees.

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Earthmaster Farms, Box C-10,
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NAME .....
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Several years ago my brother-in-law operated a farm on which there was a small apple orchard. All he used to destroy the caterpillars in the nest that appeared in the apple trees was the discarded oil from the crank case of an automobile. A rag or cloth was tied on the end of a pole (long or short as required) and dipped into a container filled with the discarded oil from the crank case of an automobile. The swab was completely saturated and rubbed into the caterpillar nest in the tree. The result was sure death for practically all the caterpillars.

I, personally, had occasion to try it some four or five years ago on a five acre place I own in New Hampshire. Many of the wild cherry trees and wild apple trees were infested with caterpillar nests. I obtained a waterpail full of discarded crank case oil from a local garage and early one morning before the caterpillars had left the nest I went to work on them. I saturated the caterpillars and nest with the oil. For two or three years thereafter I saw no caterpillar nests and the trees were apparently unharmed.

In the evening or early in the morning is the best time to apply the oil because the caterpillars return to the nest for the night and leave it the next day to feed on the foliage.

Arthur Seal,
Forty Fort, Pa.

Answer

Dear Mr. Seal:

Replying to your letter of May 15th, the only trouble is that crank-case oil is a rather strong material. In fact, it is used to eradicate certain kinds of weeds. After applying it to the tree the rains would wash it into the soil. Some of it would probably be absorbed into the bark.

Personally, if I was interested in farming 100% in the organic manner, I would first try to get real health in the tree by working plenty of good finished compost in the soil under it, and applying a mulch to prevent the grass from growing under the tree. It may take three or four years to get the orchard into good heart to withstand insect

De La Mare Garden Books

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Organic Gardening — Emmaus, Pennsylvania

inroads, but it probably would pay in the long run. We are doing this on our farm. This is the second year and already the trees show a noticeable improvement. Real results should be obtained in about four years, but then you've got something.

When it is considered how expensive it is to spray the average orchard, and what can be accomplished if that money was taken and used in making compost, it might be worth a trial. The orchardist, of course, cannot afford to put his orchard out of production for a few years, so he must go about it on a small scale first, gradually applying it to parts of his orchard.

●

MULCH — ACID

Dear Editor:

If oak leaves used as mulch do not make the soil beneath acidic, how about sawdust used as mulch? Does it make the soil acidic? And what reaction does peat moss have on the soil when used as mulch?

Jeanette Peticolas,
Simsbury, Conn.

Answer

Dear Miss Peticolas:

Sawdust will provide an acid mulch, as will peat moss. Coffee grounds are excellent for this purpose also, and give good results when used for azaleas and rhododendrons. Pine needles can be used for the same purpose.

Although it has been stated lately that oak leaves, when decomposed are not acid, I would recommend their use where an acid mulch is necessary. In the forest, the mulch is practically all leaves and presents an acid condition. Nature, as a rule, is not wrong in the way she farms.

●

LEAVES — MAGNOLIA

Has any reader had experience in decomposing magnolia tree leaves? These seem to be very stiff and leathery when dry and might require special handling.

●

EARTH

Dear Sirs:

I have a small pond of about two acres which in summer is usually quite dry. As this pond is about 90 years old, it is filled with dead leaves that fall every fall and the resulting muck looks quite rich. Can I use this muck on the garden by mixing it with compost, earth and dead weeds, etc.? Like all old ponds, it is slowly filling up with this muck and the dam, which is also 90 years old, will have to be raised and rebuilt to have any water in the pond at all during the dry spells.

E. G. Manning,
Woodbury, Conn.

Answer

Dear Mr. Manning:

Replying to your letter of May 25th, the type of earth you mention would be excellent to be mixed with composts, other earth, etc. It also could be used in the compost heaps. If it is water-logged it should be dried somewhat before use, unless it is going to be placed in a compost heap. It might also be acid, and should not be used on the land without thoroughly mixing other soil with it.

●

COMPOST — INGREDIENTS

Dear Mr. Rodale:

The Van Nuys Garden Club are teaching composting, but state, that with sandy soils, carrots, carrot tops and potato peelings should not be used because when the compost is returned to the soil nematodes are encouraged. Is this true?

I make my compost heaps according to your booklet, although I do not have any in my soil I find when turning the heaps a considerable number of *cut worms*. I make my heaps of garbage, horse manure, oats, hay, alfalfa, weeds and rabbit droppings. Can you tell me which ingredient causes the cut worms?

Harold Wilkins,
Van Nuys, Calif.

Answer

Dear Mr. Wilkins:

Your trouble may be caused by the garbage which probably contains meat and fish cuttings. Meat and fish cuttings usually will be broken down by maggots which die off when the material is thoroughly broken down. They are not harmful to the soil.

When you state that you saw cutworms, is it possible that they were merely small maggots? This is the first time that I have heard of compost heaps being a propagator of cutworms. Please check further, and let us know if possible.

Regarding the Van Nuys Garden Club, we would advise that any kind of green or vegetable matter can be used in the compost heap, except the eucalyptus leaves, which grow in your part of the country. If the vegetable matter is thoroughly composted and used, this should be an antedote against nematodes, rather than to encourage them. Is it possible that the Van Nuys Club is making their compost with a chemical activator, which is sold for the purpose of expediting the making of compost? We do not recommend any of these chemical activators.

AN AGRICULTURAL TESTAMENT

By Sir Albert Howard, C.I.E., M.A.
Formerly Director Institute of Plant Industry Indore, and Agricultural Adviser to Central India and Rajputana.

Sir Albert Howard C. I. E., M. A.

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